USDA/NASA Workshop
Breakout Synthesis Report

Focus Area: **Invasive Species**

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Number of Breakout Groups: 2

Total Participants: 24

Part 1 – Requirements Definition
Part 2 – Research & Data Relevance
Part 3 – Gap Identification
Part 4 – Collaborative Opportunities

PART 1 – Requirements Definition

What are USDA's policy and program needs that might be fulfilled with earth science and remotely sensed information?

Primary

- Knowledge about the biological processes for prediction and management
- Geospatial data for inventory and monitoring
- Pest management strategies based on pathways, risk analysis, economics
- Standards and framework for statistical analysis

Comments

- These are not sequential objectives but parallel tracks of needs
- Many related bullet terms are consolidated under the prioritized lists

Examples

- Capture existing information in format that can be synthesized; inter-operability of available data sources
- Meeting healthy forest initiative; change detection and monitoring; compliance; trends
- Signatures of invasive weeds; how to develop spectral libraries; standards for cross-comparison; libraries of host plants for invasive pests, microbes;
- Habitat characterization requirements
- Focus on predictive capabilities; risk mapping capability
- Damage detection caused by biological control agents on target weeds vs. healthy vegetation
- Technology transfer; software and training; field equipment; training end users;
- Tool to evaluate functional ecology so that impact of invasive species can be quantified;
- Map and monitor recovery state and rate of recovery
- Seamless databases at all scales to national, on all important invasive species

- Uniform data quality standards needed for all data collected in field, image analysis methods
- Develop common validation methods
- Pathways of introduction of all invasive species; risk analysis
- Improved methods to train citizens to provide data to invasive weed databases
- Understanding statistical difference from plot, ground data vs. different scales of remotely sensed data
- Use of remote sensing to understand the biology of invasive organisms
- Strategy for integrating data and data collection between scales

PART 2 – Research and Data Relevance

What is the state-of-the-research (USDA and NASA) and current NASA measurement and modeling capabilities that are relevant to these needs?

Primary

- The state of biological knowledge about invasive species is variable. Groundwork has been laid for more comprehensive studies of invasive species.
- For limited geographic areas there are available databases for monitoring and predicting spread of invasive weeds. Some comprehensive models have been done (e.g., leafy spurge)
- Ability to detect some weed species from background vegetation using remote sensing
- NASA has many sensors that are needed to do Inventory and monitoring. Data are available at high spatial sampling; scattered studies are being funded for a few species; remote sensing studies are localized.
- USDA, BLM, USFS has a large amount of ground based data on invasive species
- Geospatial data available: weather information, wind

directions, temperatures, transportation corridors, habitat maps, land use/land cover maps, GIS data/metadata standards

- Long term remotely sensed Landsat, AVHRR, databases are available at USGS. AVIRIS data and other aerial imagery available from JPL and NASA Ames Research Center (Aircraft Data Facility)

PART 3 – Gap Identification

What are the gaps in existing knowledge and research pertaining to the ability of earth science to address the USDA needs?

Primary

- No systematic design for analysis at different scales from small sites to national scales. Developing standards to test large scale from small sites.
- Continued development of models and geospatial databases required
- Development of software/hardware for database analyses and management
- Need to develop image analytical basis for detecting species, translate to different instruments (bandpass resolution, radiometric resolution), spectral libraries, phenology, and spatial resolutions, damaged vs. healthy target plants, weeds vs. native species, portability of methods
- Need for wider swaths (especially hyperspectral), more frequent revisit to mitigate cloud conditions of space-based instruments or additional airborne instruments.
- Standardization of inventory and monitoring techniques with sampling based on geostatistical landscape theory
- Improved atmospheric calibration for surface reflectance.
- Early warning events for risk assessment

- Predictive modeling: economic cost/benefit assessments, risk of spread, pathway analysis for transport methods and rates, accuracy assessment—probability of confidence

PART 4 – Collaborative Opportunities

What are the opportunities for collaborative/cooperative R&D efforts between USDA and NASA to develop products and solutions that serve decision makers?

Primary

- Compile success stories: need to organize assessment methods – what can and can't been done. Need to link methods to absolute needs.
- Interdisciplinary field and modeling experiments (e.g., BOREAS). USDA could develop ecosystem working groups, including end-users, for priority problem areas (e.g., a 5-10 year program to solve saltcedar problem)
- Encourage NASA to prioritize AVIRIS data collect over weed sites in FY 04. Get data of U.S. sites to more people.
- Integrate weather prediction, remote sensing and biological models to predict infestations of pests/pathogens
- Workshops on methods
- Monitoring around potential high-risk areas – e.g. ports.